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U.S. Army - Baylor University Graduate Program in Health Care Administration

Graduate Management Project:

**The Capital Equipment Acquisition Process at The Johns Hopkins
Hospital
Evaluating Acquisition Strategies Through Financial Analysis**

Submitted to:

Lieutenant Colonel Brett Walker, FACHE, M.H.A.

April 21, 1998

By:

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REPLY TO
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ACADEMY OF HEALTH SCIENCES
2250 STANLEY ROAD
FORT SAM HOUSTON, TEXAS 78234-6130

February 20, 1998



Center for Healthcare
Education and Studies

SUBJECT: Residency Written Requirement

Mr. Terrence T. Cunningham
The John Hopkins Health System
600 N. Wolfe St/Houck 193
Baltimore, MD 21287

Dear Mr. Cunningham:

This acknowledges receipt of the below listed residency report requirements for Captain Colleen A. McGowan, U.S. Air Force.

2nd Quarter Residency Progress Report - APPROVED

Graduate Management Project - APPROVED W/MINOR MODIFICATIONS
(GMP)

The GMP has been reviewed by the resident's faculty reader and is found to need minor revision before satisfying the standards established by our Program. Captain McGowan has been provided the corrections. She is required to resubmit the Graduate Management Project after making all requested modifications.

Sincerely,

Jody B. Rogers, Ph.D.
Lieutenant Colonel, U.S. Army
Director

U.S. Army-Baylor University Graduate
Program in Health Care Administration

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Acknowledgments

The staff at The Johns Hopkins Hospital continues to exemplify the institution's century-old commitment toward educating health care professionals by providing countless hours of support and counsel in completing this project. Often a student encounters resistance when trying to complete an academic endeavor, but I continued to be overwhelmed by the helpfulness of the senior staff members involved in this project. I would like to thank the Vice President of Administration, Terry Cunningham and the Clinical Director, Department of Radiology, Outpatient Center, Bob Gayler, MD, for participating in the many working meetings held to finalize the capital equipment decision process. Mr. Arnold Mahachek, Capital Equipment Administrator for The Johns Hopkins Hospital, was also an indispensable guide, offering many creative suggestions for the spreadsheet formulation. His mastery of Financial Accounting Standards Board rules helped me add another facet to the final product—an automatic lease classification. I hope that the resulting project will meet their expectations and assist them in making fiscally and clinically sound capital equipment acquisition decisions.

Abstract

Academic medical centers face a unique challenge when deciding whether to acquire new technology. With increasing reliance on medical technology for diagnostic and medical treatment in the marketplace, academic medical centers continue to make large investments in capital equipment while simultaneously attempting to reduce costs. More stringent technology assessments are now employed by many institutions to ensure capital dollars are used to purchase necessary and cost effective equipment.

The purpose of this paper is to first develop an equipment evaluation process at The Johns Hopkins Hospital which considers both clinical and financial factors when allocating capital dollars to acquire equipment. Once the decision to acquire the equipment has been made, the next step is to select the most financially beneficial method of acquisition. The second goal of this project is to provide decision makers with a spreadsheet which will compare the costs of lease versus purchase financing to help them select the least expensive option.

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Introduction

Academic medical centers institutionalized the American concept of equating high quality health care with research capability and technological innovation. Over the years, teaching hospitals have become bastions of research and technological advancement, attracting American and international patients wishing to receive the latest medical treatments. Unlike other countries which ration technological innovation as a cost control measure, the market-driven U.S. health care system offers patients and physicians a plethora of options in care provision. However, this freedom of choice also translates into high costs, where U.S. health care expenditures comprised 13.6% of the Gross Domestic Product in 1996, the highest in the world (Universal Almanac, 1997). Market-driven technological purchases coupled with unrealistic patient expectations ignited a health care spending frenzy. U.S. healthcare expenditures rose from \$247 billion in 1980 to \$989 billion in 1995 (U.S. Bureau of Census, 1997) and medical equipment purchases totaled \$48 billion in 1996 (American Political Network, 1997). A Minnesota health care association called the Medical Alley Technology Task Force attributed this spending escalation to "...an insatiable demand for the newest and latest in technology without the full knowledge of a technology's cost or its overall ability to improve patients' health outcomes." (Werner, 1991). Academic medical centers have built their reputations on their ability to satisfy patient demands while challenging physicians in the research arena.

Three significant events in the 1980's and 1990's threatened the academic medical center's ability to remain financially viable while satisfying patient and physician demands for technology: the Prospective Payment System, the abolition of the capital pass through rate, and managed care competition. First, in an effort to control escalating health care costs, the

government introduced the Prospective Payment System in 1982. This program reduced payments to hospitals based on prices attributed to Diagnostic Related Groups (DRG) rather than costs assigned by individual hospitals. This payment system motivated hospitals to become more efficient and reduce operating costs. Advances in medical devices and procedures such as Magnetic Resonance Imaging (MRI) and cochlear implants are now reimbursed by DRG, but often at rates below the average cost of acquisition. Such underpayment can influence the rate at which hospitals adopt such technologies. As Nancy Kane and Dr. Paul Manoukian noted in their research on technology adoption, the negative payment incentives of the Prospective Payment System compete with clinical considerations for the first time, when hospitals and physicians decide whether to acquire new technology (1989).

Another factor that promises to influence the academic medical center's technology acquisition process is Medicare's phase out of the capital-pass-through-rate by 2002. Hospitals have enjoyed reimbursement from third party payors to compensate them for 30% of interest and depreciation expenses associated with capital equipment acquisitions and facility construction projects (Gapenski, 1993). Future capital cost reimbursements will be given to hospitals in the form of a Prospective Payment System, again motivating hospitals to examine cost control mechanisms and to reevaluate capital equipment acquisition making processes.

The third factor which challenges academic medical centers is the effect of managed care competition. Although there are no signs that managed care is slowing the research pipeline, managed care's emphasis on cost containment does influence the types of technology which are adopted (Goodman, 1997). As consumers become more educated on alternative treatments and more sensitive to medical care costs, they become more selective in their choices for medical care. Costs associated with evaluating new drugs, training, and developing both new technology

and therapies increase overhead costs at academic medical centers, making them 30 percent to 40 percent more expensive than non-academic hospitals (Nauert, 1995). Decreasing rates of reimbursement and increased sensitivity to health care costs have forced academic medical centers to reduce costs and to forge new alliances with primary care physicians and managed care organizations to secure a referral base for their specialties. Aggressive utilization review combined with an evaluation of the financial impact of acquisition alternatives are key to minimizing cost, increasing cash flow, maximizing reimbursement, and maintaining profitability in this competitive environment (Sadock, 1995).

Teaching hospitals are faced with a dilemma of satisfying the needs of two distinct groups--retaining and recruiting physicians accustomed to demanding the latest technology, and attracting consumers whose sensitivity to the high cost of such technology might dissuade them from seeking care at expensive hospitals. Equipment acquisition decisions have traditionally been based on perceived demand in an industry which attempts to be all things to all people (Weingart, 1995). With utilization rates of moveable medical devices hovering around 56% (Sadock, 1995), physicians and administrators at academic medical centers must closely evaluate equipment acquisitions decisions as well as acquisition methods to ensure cost effectiveness and patient concerns are adequately addressed.

Problem Statement:

Academic medical centers face a unique challenge in making sound capital equipment decisions based on conflicting goals—subsidizing expensive research and the desire for the latest technology while being confronted with the competitive pressures of reducing costs. Technology assessment committees offer a solution to this dilemma, where multi-disciplinary groups of technical experts and administrators evaluate the necessity and cost effectiveness of equipment

procurement. As departments compete for diminishing capital funds, they must present thorough financial and medical justification for equipment purchases.

Conditions which prompted the study:

Johns Hopkins Medicine, an entity comprised of the University's School of Medicine and The Johns Hopkins Hospital (JHH), is renowned internationally for its research capability and clinical expertise. Commensurate with this commitment to technological advancement, Johns Hopkins spends millions of dollars on capital equipment annually. In the FY 98 budget, \$7 million was allocated to the Johns Hopkins Hospital and \$13.2 million to the School of Medicine. Reliance on technologically advanced diagnostic testing has gained increasing importance in care provision, particularly in radiology. Because this technology is changing at such a rapid pace, the Department of Radiology consumes a large portion of the JHH's capital equipment budget.

The capital equipment acquisition process for the Department of Radiology has come under close scrutiny as delays in requisition processing have stalled equipment acquisitions. The Executive Dean of the School of Medicine, who also retains his position as the Chairman of the Department of Radiology, was frustrated by these delays and asked the Vice President of Administration to address the problem. Likewise, administrative staff members were frustrated by the lack of documentation provided to ensure due diligence (i.e. equipment justification, alternative acquisition method comparisons) had been accomplished. This abstract concept of due diligence was often left to the subjective interpretations of various persons throughout the process, preventing the equipment requisition from moving forward. Understanding that competitive pressures have motivated hospitals to control escalating costs, administrators at The

Johns Hopkins Hospital have a fiduciary responsibility to ensure funds are directed toward endeavors which support the mission and recognize organizational financial constraints.

The Vice President of Administration and Chairman of the Department of Radiology established two goals for the capital acquisition process: eliminating delays and reevaluating due diligence requirements to ensure qualitative and quantitative factors were considered in each decision. In analyzing this process, there also appeared to be an institutional proclivity toward purchasing as an acquisition strategy. Once equipment was approved for procurement, the user dictated the acquisition method without providing a financial comparison among the various choices. Although there are merits to a qualitative approach toward acquisition choices, financial analyses assist decision makers in selecting the most cost effective procurement strategy in a time of cost containment. Capital equipment review needed to compare the financial impacts of different acquisition strategies such as leasing or purchasing while responding to the time sensitive demand for equipment by individual departments.

Literature Review

Decision Making Strategies

Technology acquisition is an expensive and uncertain endeavor, an investment which hopes to attract patients and enhance the organization's reputation. Given the rapid rate of technological advancement, such huge capital investments are laden with risk from regulatory and financial perspectives. However, capital equipment investment decisions are often based on broadly defined technology assessments which rarely produce a methodical appraisal of the financial, clinical, social and ethical consequences of new procedures (Weingart, 1995). In a study of decision making at twelve academic medical centers, Saul Weingart discovered that while financial impacts of the equipment acquisition were cited as the most widely used decision

criterion, clinical considerations including the technology's contribution to teaching and research were considered more important criteria (1993). According to this same study, most institutions did not perform formal technology assessments, and most decisions were described as political or informal with no explicit criteria to evaluate technology. Political interests often influenced equipment acquisition decisions where physician compensation packages often included promises to purchase new technology as an incentive to retain and recruit renowned physicians.

Uncertainty abounds in capital equipment acquisition, particularly for academic medical centers whose culture embraces innovation in health care provision. In addition to the difficult task of estimating an equipment's useful life in light of the threat of impending obsolescence, academic medical centers are particularly sensitive to the risk of buying medical devices that might not gain Food and Drug Administration approval. Because the clinical trials associated with medical devices is not as rigorous as those for pharmaceuticals, technology is often diffused in the marketplace without adequate evidence of safety and efficiency (Williams & Torrens, 1993). Technology-enamored academic medical centers are often among the first to acquire new medical devices, committing hospital resources to purchase equipment prior to evidence of favorable diagnostic or clinical performance. Equipment decisions based on subjective assessments could produce negative financial and clinical outcomes, as evidenced by the case of the biliary lithotripter. Many hospitals rushed to adopt this non-invasive method of shattering gall stones without adequately addressing the risks of acquisition. The biliary lithotripter failed to secure Food and Drug Administration approval after patients complained of excessive pain, and a more effective procedure called the laproscopic cholecystectomy was introduced (Weingart, 1995). Institutions which purchased the biliary lithotripter were left with an expensive piece of equipment which became obsolete shortly after its introduction.

Some hospitals have removed much of the political influence from equipment acquisition decisions by adopting a more centralized and methodical approach. Technology assessment teams composed of interdisciplinary members evaluate equipment requests based on definitive criteria such as clinical necessity, compatibility with existing equipment and systems, operational history, costs of ownership, and other market factors (Franklin & Altman, 1996). A study conducted by The Health Care Advisory Board attests to the prevalence of this multi-disciplinary approach to technology assessment, where four not-for-profit hospitals used such forums to evaluate demand and utilization projections, regulatory and reimbursement issues, comparative profiles of the market area's services, and the impact of technology on existing services (1995). These teams examined equipment acquisition from a macro perspective, investigating the current fleet size and possible reallocations of equipment from various departments within the health system. Some hospitals even tested the safety and efficacy of equipment by performing post-purchase utilization and patient outcomes evaluations, and also ensured employees were adequately trained to operate the equipment by mandating vendors to provide free on-site instruction (The Advisory Board Company, 1995). Such methodical and team-oriented equipment acquisition strategies ensure hospital funds are invested prudently.

When contemplating decision criteria for technology assessments, hospitals must balance financial issues with clinical concerns. Although the physician continues to act as a powerful catalyst in technology acquisition decisions, hospitals expect quantifiable benefits in purchasing technology. Hospitals now require business plans, revenue estimates, and the number of full-time equivalents to operate the equipment as justifications for equipment acquisitions when developing capital budgets (The Health Care Advisory Board, 1995). Many hospitals profiled in this same report said that department managers play in an increasingly important role in the

capital equipment budgeting process, where scarce capital dollars are allocated based on the ranked perception of the technology's impact on patient care, revenue generation, and overall cost (1995). Ambiguous assertions of clinical necessity and competitiveness are no longer sufficient to convince hospital board members to acquire new technology. Departments must become better equipped to quantify savings as well as research innovative acquisition strategies as they compete for scarce capital funds.

Leasing as an Acquisition Strategy

In addition to quantifying savings in terms of increased revenue or cost reductions, hospitals must also evaluate the most cost effective method of acquisition. Because hospitals are no longer limited to purchasing as an acquisition strategy, equipment evaluations must address the various financing options available. As the health care industry becomes more reliant on technology, manufacturers and distributors have developed acquisition strategies to accommodate the growing numbers of health care organizations that wish to adopt new technology. In addition to the traditional purchase, vendors offer many financing options for equipment, including leases and volume-based payment contracts. As the competition among manufacturers and third party vendors increases, inventive arrangements are created to secure business. An example is a common laboratory agreement which involves a combination equipment and supply contract. The lab buys a fixed amount of reagents from the manufacturer and in turn receives reduced rental payments for the respective equipment (Rosenbaum, 1991). Hospital capital equipment decisions must examine the full range of acquisition strategies to ensure it selects the most lucrative method in terms of cost and risk.

Traditionally utilized in the retail sector, lease financing has gained increasing importance in the health care industry. In a survey of 126 Florida hospitals (Gapenski & Langland-Orban, 1991), the most frequently cited advantages reported as motivations for leasing include:

1. Preserving cash by avoiding a single large payment (62.7%).
2. Passing residual value risk and obsolescence risk to the lessor (61.9%).
3. Reporting lease payments as an operating expense, to preserve debt capacity (34.1%).
4. Including maintenance in lease payments (25.4%)

With a variety of health care organizations attempting to gain a competitive advantage in a technologically robust marketplace, leasing becomes a viable option for debt-laden entities.

The first advantage contrasts the substantial initial cash outlay associated with a purchase to leasing's more flexible financing option. By spreading payments over a specified period of time, cash constrained hospitals are able to acquire expensive equipment. The results of a 1992 survey of 505 hospitals attest to this perceived "lease financing benefit" in acquiring high cost items, where automated lab equipment was cited as the most widely leased asset at 28.5%, followed by MRIs at 28.4% and CT Scanners at 27% (Anderson, 1992).

Leasing offers an additional benefit in providing a hedge against the risk of equipment obsolescence. As stated earlier, the rate of technological innovation in the health care industry makes it difficult to estimate how long the equipment will be utilized. By transferring this risk to the lessor, the lessee has the benefit of canceling the lease when the equipment becomes obsolete, or requiring the lessor to upgrade existing equipment. Correlated to obsolescence risk, the difficulty of estimating the residual values of equipment makes purchasing a very risky proposition. A lessor may be better suited to bear this risk based on its diversified equipment portfolio and its ability to sell used equipment in other lucrative markets (Gapenski, 1996).

However, this risk trade-off translates into higher monthly premiums to the lessor compared to similar monthly loan payments made to a lender. When contemplating lease versus purchase decisions, executives should ask themselves whether the reduction of this obsolescence risk is worth the higher cost (Gapenski & Langland-Orban, 1991).

Health care executives also claim off-balance sheet benefits of equipment payments as an advantage of operating leases. Lease arrangements can either be classified operating leases or financial leases. Operating leases exemplify the traditional lease arrangement where the lessor provides maintenance and assumes the risk of technological obsolescence by including a cancellation clause in the contract. Conversely, financial leases resemble purchase arrangements because these contracts exclude maintenance, cannot be canceled, and have lease payments which mirror the cost of the leased asset (Gapenski, 1996). Operating leases are favored by hospitals because lease payments are considered operating expenses. Therefore, debt capacity ratios do not reflect such equipment acquisitions as capital expenditures. However, the lease/purchase decision should not hinge on this perceived benefit. Since operating lease payments are included in the footnote of financial statements, the likelihood of creditors ignoring lease obligations in evaluating a hospital's debt capacity is remote (Bayless, 1985).

Lease financing is not always the best option in equipment acquisition. If the equipment has a long useful life, or the risk of obsolescence is low, purchasing is often less expensive than leasing. Many corporations prefer to own equipment rather than burdening contracting personnel with the responsibility of overseeing a multitude of leasing arrangements. Among the disadvantages cited by the Gapenski and Langland-Orban study, the high cost of leasing was noted as the most prevalent disadvantage, followed by the expense associated with early termination of the lease contract and the loss of the residual value of the leased asset (1991).

Because opinions regarding lease versus purchase acquisition strategies vary widely, financial analysis can assist decision makers in choosing the most advantageous strategy.

Lease vs. Purchase Analysis Methodologies

Financial comparisons of net cash flows associated with lease and purchase acquisition strategies are the basis upon which to select the most cost effective strategy. Equating future cash flows to present dollars is an uncertain venture, given the volatility of reimbursement rates, anticipated demand for technology and the equipment's effect on other services (Weingart, 1995). Many decision makers, physicians and administrators alike, lack the financial skills to perform methodical financial analyses. Surprisingly, this financial ineptitude is not isolated to health care. In a survey of the 200 largest U.S. industrial firms, all but 2 of the 48 respondents utilized a lease vs. purchase analysis which was inherently biased toward purchasing because their analysis failed to account for the risk associated with the cash flows (Pritchard & Hindelang, 1984). Key factors in producing an unbiased and accurate comparison between financing options are: choosing an appropriate discount rate which is consistent with the uncertainty of future cash flows, and selecting the relevant cash flows for each alternative.

Net Present Value vs. Internal Rate of Return

The most widely acknowledged tools in analyzing capital investment decisions are Net Present Value (NPV) and Internal Rate of Return (IRR). NPV is a discounted cash flow technique which translates future cash outflows and inflows throughout the life of a project venture into a present dollar value. A investment option which produces a positive NPV is considered a wise investment since cash inflows exceed cash outflows. IRR is defined as the discount rate which equates all future cash flows to the present value cost of the project (Gapenski, 1996). IRR is often compared the hurdle rate for projects or investments of equal risk

to evaluate the financial benefits of proceeding with the venture. If the IRR percentage is greater than the opportunity cost of investing in a project of similar risk, then the project is considered financially desirable.

NPV is often used as the only financial measure to compare equipment acquisition strategies, because decision makers prefer dollar estimates of profitability to the nuances of ratio evaluations. However, NPV does have some shortcomings, particularly the difficult and time-consuming task of figuring the cost of capital, also termed the discount rate, to equate future cash flows to present value dollars. This discount rate accounts for the riskiness of future cash flows, the difficulty in estimating the residual value of the equipment, and the tax benefits associated with debt financing. Erroneous estimations of such uncertain variables could produce an inflated NPV, potentially driving decision makers to choose unprofitable new ventures. Another limitation is that risk is assumed to be equal among competing projects, where NPV favors larger projects and neglects smaller aggregate projects which are inherently less risky (Martin, 1997). If the discounted cash flows associated with a project have a high NPV, decision makers will likely choose this alternative without weighing the impact of discount rate changes on the NPV.

IRR, on the other hand, is considered a relative measure of a project's value, allowing the decision maker to compare unlike investments, different discount rates, different periods and different sized firms (Martin, 1997). IRR compares both the cost streams associated with lease and purchase financing by through ratio analysis. The Internal Rate of Return is listed as a percentage that is measured against the cost of capital to determine if the cash flow streams associated with lease financing yields a lower "borrowing rate" than purchasing debt, such as a loan. Martin contends that IRR should not supplant NPV as a financial decision criterion, but should complement NPV to yield a stronger and comprehensive analysis.

Purpose Statement:

The purpose of this paper is to first reevaluate the current capital equipment acquisition process for the Department of Radiology and devise a methodical equipment evaluation process which balances expediency with due diligence. The second goal is to develop an acquisition decision tool to ensure qualitative and quantitative considerations are addressed when analyzing acquisition methodologies. This user-acceptable spreadsheet will assist decision makers in performing a cost/benefit analysis which compares leasing and purchase strategies to determine the most advantageous means of acquiring equipment.

Methods and Procedures

This project will focus on a qualitative approach to process improvement, utilizing flowcharting techniques to critically evaluate the existing capital equipment approval process for the Department of Radiology. The first step in identifying bottlenecks and duplication in the process is to flowchart the existing process. This was accomplished by consulting organizational policy statements and interviewing Department of Radiology staff members, the Capital Equipment Administrator in Finance, the Senior Director of Finance, the Project Manager for the Vice President of Facilities, the Project Manager for the Vice President of Administration, the Legal Department, and Purchasing. To validate the inputs from these varied sources, three equipment requisitions were handcarried through the process. Incorporating actual experience with policy was an iterative process, generating six drafts before the final current flowchart was developed. This flowchart, found in Appendix A, was distributed to all the capital equipment members listed above for approval.

Once these players in the Radiology equipment approval process reviewed the current flowchart, interviews were again conducted to solicit ideas for expediting the process. These

same respondents were interviewed individually to ensure creative ideas were not suppressed when critically reviewing this potentially contentious issue. Many offered ideas to accelerate the process while ensuring that due diligence oversight was incorporated in the new model. Eight drafts were produced before members convened to discuss the proposed changes. A series of three meetings was held, with the Clinical Director, Department of Radiology, Outpatient Center, the Assistant Administrator of Radiology, Purchasing, Legal, Facilities and Finance representatives, and the Vice President of Administration participating. These meetings focused on reducing requisition processing time and delineating responsibilities of members throughout the process. The group agreed that the flowchart which emerged from the successive meetings would be a first step in depicting an evolutionary requisition process which advocated a more multi-disciplinary approach to equipment acquisition. Other goals of the meetings were to define due diligence from a regulatory and organizational perspective and devise a process which ensured supporting justification for equipment purchases was commensurate with the equipment's value. The amalgamation of ten revised drafts yielded a new flowchart, shown at Appendix B. This flowchart illustrated the equipment request's journey through the system from its initiation in the Department of Radiology to the capital budget approval cycle, and ending with Purchasing Department's equipment order from the vendor. During the final meeting, the group agreed to test the new process and proceed with implementation.

The second part of the project analysis used financial functions available in spreadsheet applications to evaluate leasing and purchasing acquisition methods. Cornerstone to this financial comparison were Net Present Value and Internal Rate of Return calculations which emanated from the cash flows associated with the lease and purchase decisions. Comparing the cost of lease financing to the cost of debt financing is the most effective way of evaluating each

option, neglecting the various purchase financing alternatives (Gapenski, 1996). To simplify the comparison, Gapenski uses a term called the Net Advantage of Leasing (NAL) as the decision criterion. This number is computed by subtracting the Net Present Value (NPV) of owning from the Net Present Value of leasing. If this number is positive, leasing is the best acquisition strategy, and if negative, purchasing is more cost effective. Because revenues associated with new equipment ventures are uncertain, cash inflows will be ignored in this analysis. Input variables required to generate these calculations will be:

- 1) *Cost of Capital* : This rate is often used as a hurdle rate to evaluate capital investment decisions. This cost of debt and equity is based on the opportunity cost of investing an organization's funds in a venture versus an alternative investment of similar risk (Gapenski, 1996). Since not-for-profit organizations, like The Johns Hopkins Hospital, have access to low interest-bearing sources of debt, the cost of capital is traditionally lower than their tax-paying counterparts. Although this rate often mirrors the cost of debt (such as a loan interest rate), it can be adjusted to reflect the uncertainty of the cash flow stream associated with a new acquisition. If the proposed equipment acquisition is perceived to be a higher risk venture than the average investment, the discount rate should be increased to compensate for the increased cash flow uncertainty (Gapenski, 1996). This analysis will consider average risk ventures to have a discount rate of 8 percent, which corresponds with the JHH policy to have the discount rate mirror the prime rate. Above average risk ventures will be increased three percentage points, based on input from the JHH Capital Equipment Administrator. The spreadsheet will call this cost of capital the loan interest rate since users will have varying levels of financial expertise.

- 2) *Salvage value estimate*: The fair market value of the equipment at the end of its useful life.

Although the terms salvage value and residual value are used interchangeably, residual value estimates apply to leases and salvage value estimates refer to owning. Residual value is not synonymous with the salvage value because the vendor dictates this value at the negotiating table. In contrast, salvage value estimates vary from year to year based on inflation, supply, demand, technological obsolescence (Held, 1991).

- 3) *Salvage Value Discount Rate*: Similar to the cost of capital, the degree of uncertainty associated with the fair market value of equipment item must be addressed by utilizing a higher discount rate.

- 4) *Fair Market Value of the Equipment*: Taken from nationwide pricing comparison company called MD Buyline, this value is important in classifying operating and financial leases.

- 5) *The useful life of the equipment*: This estimate is dependent upon technological changes in the industry, obsolescence, renovation costs, as well as the comparative advantage an acquisition might secure for the hospital in its market (Pritchard & Hindelang, 1984). Since the Modified Accelerated Cost Recovery System (MACRS) depreciation schedule used by most organizations for equipment is in three-, five- or seven-year increments, these time frames will be used to approximate useful life estimates.

- 6) *Maintenance Costs*: One of the most important distinctions between operating leases and financial leases is the maintenance component. Financial leases resemble purchasing contracts where payments equal the cost of the asset, and are considered capital expenses on financial statements. Maintenance is also excluded from these irrevocable contracts. In contrast, operating leases exemplify the traditional lease arrangement where the lease duration is shorter, payments are treated as operating expenses, and maintenance is included

in the contract. Since Johns Hopkins policy prohibits the use of financial leases, this spreadsheet will factor maintenance into the cost of the lease payment. To ensure an equitable comparison of the two acquisition methods, maintenance payments must be listed as a separate line item in the purchasing decision model. Excluding these operating costs from the analysis will favor purchasing in every scenario.

- 7) *Lease payment and purchase price.* The annual lease payment for the contract duration or the outright purchase price of the equipment.
- 8) *Tax rate:* Cash flows associated with tax-paying hospitals must reflect the tax benefits of leasing and purchasing, such depreciation and interest tax shields. Although the tax rate is effectively zero percent for most Johns Hopkins Health System entities, there are a few tax-paying Limited Liability Corporations (LLC) under the organizational umbrella which would need to evaluate tax considerations in the decision process. The tax rate is included in the spreadsheet in the event these organizations use this decision tool in the future. Since The Johns Hopkins Hospital is a non-tax paying entity, the analysis will ignore tax considerations.

An additional element in lease financing is its accounting classification. The Johns Hopkins Hospital does not pursue financial leases because of the debt apportionment on the balance sheet. To be labeled an operating lease, contracts must abide by the following Financial Accounting Standards Board (FASB) 13 criteria:

- a. The present value of the lease payments cannot exceed 90% of the fair market value of the equipment (Nunnally, Plath & Johns, 1991).
- b. The lessee cannot claim any additional ownership investment in the equipment other than lease payments (Gapenski, 1996).

- c. The length of the lease must be less than or equal to 80% of the economic life of the equipment (Gapenski, 1996).
- d. The lease cannot establish a preset purchase price at the lease's inception (1996).

The Capital Equipment Administration is responsible for validating lease accounting classifications, and manually calculates many of the decision variables mentioned above. Incorporating FASB 13 rules in the automated decision tool will assist the Finance Department in accelerating this function.

In addition, sensitivity analysis will be included in this analysis to isolate those input variables which greatly influence the decision to lease or purchase capital equipment. Sensitivity analysis visually displays the extent to which errors made in forecasting future financial and operating cash flows will affect the NAL or NPV of the alternatives under consideration (Pritchard & Hindelang, 1984). The decision maker will assign an expected value to input variables such as discount rate, salvage value and equipment life, and the decision tool will compute upper and lower limits of twenty percent, based on the estimation. The decision tool will calculate an NAL for these three input values and will illustrate the relationship between the independent and dependent variables. The direction and magnitude of these changes will be represented by the slope of the line. The slope of the line shows how sensitive the NAL is to changes in each of the uncertain variables (Gapenski, 1996). The steeper the line, the greater the influence of dependent variables such as salvage value, discount rate, and useful life on the NAL. Sensitivity analysis will motivate decision makers to reduce the amount of uncertainty associated with those estimates which greatly influence the NAL.

In line with the goal of providing individual departments with user-friendly software packages to facilitate this comparison, off-the-self computer applications were evaluated.

Evaluation criteria included compatibility with existing network programs, and the program's ability to calculate NPV and IRR. Spreadsheet development began after several end users were interviewed to ensure all decision variables were included in the analysis. Although the untimely departure of the hospital's Capital Equipment Administrator prevented this project from reaching a testing phase for the spreadsheet, testing is recommended before deploying the decision tool to all departments.

Results and Discussion

Radiology Capital Equipment Process

The first part of the analysis—revising the capital equipment approval and requisition process for the Department of Radiology—resulted in a more synergistic and multi-disciplinary approach to equipment acquisition. A Radiology Capital Equipment Reengineering Group first examined the existing approval and acquisition process for capital equipment exceeding \$50,000, shown at Appendix A. The process begins in the budgetary cycle where Radiology initiates a five-year equipment acquisition plan. Radiology prioritizes current year items and forwards the list to the Vice Presidents' Management Committee. Based on a capital budget target provided by Finance, this group reviews all capital equipment requests for JHH and reduces the list based on safety, regulatory, patient care, return on investment, and other cost and competitive factors. The capital budget is sent in turn to the CEO and Board of Trustees for final approval.

At the start of the fiscal year, Radiology submits requisitions on prioritized items according to a cash flow analysis performed by Facilities. Radiology selects the vendor based on vendor pricing comparisons from an organization called MD Buyline, and on company service responsiveness and equipment reliability assessments. The requisition is sent to the VP of Administration to ensure due diligence has been performed. This corporate officer then asks the

Capital Equipment Administrator in Finance to review the requisition, and evaluate the supporting justification documentation. Legal then reviews the equipment requisition to develop a Purchase Sales Agreement. Financial policies specify the remaining chronology for approval, where requisitions require the signatures of the VP of Facilities, the VP of Finance, and the COO or CEO before Purchasing can order the equipment.

Although many aspects of the process were found to be deficient, the most serious concern was the lack of consistent financial analysis and utilization information (due diligence) accompanying equipment requests. This analysis was perceived to occur during the budget approval cycle, but in effect, was often neglected. When Radiology submitted the purchase requisition after it was approved by the Board of Johns Hopkins Medicine, it was often delayed when it reached the Capital Equipment Administrator because due diligence had not been completed. Radiology considered this an onerous demand since the Board had already approved the equipment purchase. Questionable due diligence prompted more stringent oversight of the requisition, expanding the role of the Minor Capital and Contingency Committee (which approved equipment purchases less than or equal to \$50K) to review all Radiology requests.

When the Radiology Capital Equipment Reengineering Group assessed the current process, they questioned the value of a retrospective Capital and Contingency Committee review for due diligence. This justification should occur at the initial budgetary cycle, with updated utilization, revenue and expense data provided when the requisition is processed. The group agreed to eliminate Capital and Contingency Committee oversight and have the VP of Administration's office review requisitions for due diligence. To ensure Radiology requests are not inadvertently routed to the Capital and Contingency Committee, the flowchart separates

major and minor capital items. The flowchart shown at Appendix B highlights those areas which had been changed, including:

1. *Involving Purchasing in the initial 5-year acquisition development stage.* The Department of Radiology worked in isolation when developing their equipment plans, excluding Purchasing in vendor selection and acquisition strategies. Purchasing often learned about equipment purchases when the department demanded an immediate Purchase Order, denying Purchasing the opportunity to negotiate more cost effective vendor contracts. Including Purchasing representatives in the early stages of equipment planning will facilitate better communication between Purchasing and Radiology. This will encourage Radiology to employ Purchasing expertise in decreasing equipment costs, and also relieve much of the urgency associated with equipment orders. Purchasing will receive a macro-view of Radiology acquisition timelines, and will no longer operate in a crisis-management mode.
2. *Purchasing contacts vendors for price quotations.* In the past, Radiology solicited vendor price quotations and negotiated contract prices without any assistance from Purchasing. Although Radiology has been successful in negotiating very lucrative purchase contracts, Purchasing involvement could enhance the acquisition cycle, offering different perspectives on acquisition strategies. Furthermore, increasing regulatory investigations of physician-vendor relationships motivates hospitals to adopt a more methodical and multi-disciplinary approach to acquisition.
3. *Business plan requirement for new ventures.* The group agreed that new business proposals required more extensive financial analysis than replacement capital requests. New business ventures with capital requirement over \$500,000 will require a business plan, using the same format Radiology used in its MRI expansion proposal.

4. *Review of current equipment with the VP of Administration prior to Management Committee review:* As the department's advocate during preliminary capital budget meetings, the VP of Administration should be able to defend equipment requests. The VP of Administration will be better equipped to respond to challenges to equipment justification if Radiology consults with him or her prior to the Management Committee evaluation.
5. *Acquisition Group Meeting at the Start of the Fiscal Year.* Unfamiliarity with Radiology's equipment acquisition plan is one of the greatest impediments to streamlining the acquisition process. Many players in this process do not have access to approved items on the list, nor do they know during which time of year Radiology plans to acquire them. Recovering this information takes time, further delaying the acquisition cycle. A proposed solution to this dilemma was to institute an annual meeting at the start of the Fiscal Year to discuss Radiology's recently formulated current year acquisition strategy. Each committee member would receive a copy of the approved items in Radiology's capital budget as well as learn about the timing of equipment acquisitions. Participants could share insights regarding innovative acquisition strategies in this forum, and also provide Radiology with due diligence requirements, commensurate with the value of each equipment item listed. Radiology could then update or supplement original due diligence documentation submitted during the initial budgetary cycle, and reduce the time delays for requisition processing.
6. *Decision Matrix for Vendor Selection.* Purchasing expressed a concern that external auditors might question vendor selection without a well-documented analysis of the competitive factors Radiology uses in its decision process. Radiology systematically evaluates each company's established track record regarding equipment reliability and maintenance responsiveness, and compares equipment costs before selecting a vendor. Transposing that

information in a decision matrix and attaching it to the requisition will expedite Purchasing's review, while averting any perceptions of impropriety by regulatory agencies.

7. *New Vendor Decision Diamond.* Legal review of contract terms can be time consuming if Radiology is using a new vendor. In contrast to replacement equipment contracts which incorporate few changes in existing Purchase Sales Agreements, Legal must draft entirely new vendor contracts. The acquisition process should provide Legal adequate time to review the new contract terms and develop Purchase Sales Agreements.

The group also explored the possibility of forming a negotiation team to help Radiology secure cost-efficient purchasing agreements. Many members remained skeptical that such a team approach would yield more cost savings than Radiology's current approach, considering the time commitment involved in evaluating each proposed acquisition.

Financial Analysis of Acquisition Alternatives

The spreadsheet development began with the selection of a MicroSoft Excel® platform, based on cost and functionality. As mentioned earlier, one of the goals of this project was to provide a simple and cost effective financial analysis of leasing and purchasing equipment. Since most functional units at The Johns Hopkins Hospital possess the Microsoft Office package, users will be able to manipulate the newly developed spreadsheet at their workstations at no additional cost. Most failures associated with new technology adoption rest in inadequate training in terms of computer applications and understanding the broader purpose of the new decision tool. These problems will be averted by focusing on user needs and selecting a computer program that is easy to understand and utilize. Because MicroSoft Excel® is such a popular spreadsheet application, internal training support is available to assist users if they encounter problems.

An off-the-shelf Microsoft Excel® based spreadsheet was evaluated at the beginning of the design phase. A search of the Internet for lease/purchase computer programs produced an application developed by Village Software® called *Lease vs. Purchase Fast Answer*®. This spreadsheet was very easy to use, taking the user through a series of input queries before computing the lowest cost equipment acquisition strategy. One feature of the program that was particularly interesting was the sensitivity analysis comparison for discount rate and the loan interest rate. The program would prompt the user to specify the beginning discount rate or loan rate and the incremental values beyond that baseline. The calculations would then be graphed to show how sensitive the NPV of leasing and purchasing were to changes in that input variable. This graphical relationship helped users identify those estimates which needed to be more closely evaluated to ensure the outcome was not adversely impacted. For example, changing the discount rate by a factor of .005 could vary NPV by 20%. In contrast, changes in the loan rate might have a negligible impact on the NPV. The decision maker would then focus efforts on gaining more accurate estimates for those variables which strongly influence the NPV.

In spite of these impressive features, the Village Software® lease vs. purchase decision tool failed to incorporate important considerations such as FASB 13 operating lease guidelines, and Internal Rate of Return comparisons. The program assumed that the term of the lease mirrored the term of the purchase, violating the FASB 13 rule on operating lease classification. In addition, the Internal Rate of Return assists the decision maker in making relative comparisons between the cost of debt and cost lease financing. Because the NPV is strongly influenced by the discount rate selected, incorrect estimates could potential kill worthwhile projects. IRR offers another means of ascertaining the lowest cost acquisition method.

The second step of spreadsheet development sought to merge IRR and FASB 13 considerations with the NPV and sensitivity calculations utilized in the *Lease vs. Purchase Fast Answer*® spreadsheet. After consulting several finance texts, the Capital Equipment Decision tool found in Appendix C through Appendix G was developed. The hallmark of this program is its commitment to providing an uncomplicated and easy-to-use spreadsheet without sacrificing sound financial analysis.

The first sheet is a Decision Input page (located at Appendix C), where the user enters values for the fair market value of the equipment, purchase price, annual lease payment, annual maintenance cost, loan interest rate (adjusted three percentage points for riskier projects), estimated salvage value, the tax rate, and the estimated useful life of the equipment. Although not featured in Appendix C, a computer command (macro) was written to automatically take users to the calculations sheet which corresponds to the useful life (three, five or seven years) chosen. These sheets can be found in Appendices D, E, and F. These three-, five-, and seven-year sheets require no user manipulations since the formulas for NAL and IRR computations are linked to the initial Decision Input sheet. The highlighted areas reflect those decision variables which will assist the user in choosing lease vs. purchase financing. While most users will be shown how to interpret the Net Advantage of Leasing and Internal Rate of Return, the program will simplify the decision process by selecting the lower cost option. If the lease financing IRR is less than the loan interest rate, lease financing should be used, and vice versa. Similarly, if the NAL is positive (greater than 1), then the equipment item should be leased. The opposite is true if the NAL is negative.

The other key decision output is the FASB 13 operating lease classification. Once the user has selected the useful life of the equipment, the program will compute the corresponding

lease term on the calculations sheet. This lease term is based on the FASB 13 operating lease rule, which states the term of lease cannot exceed 80% of the useful life of the equipment. An “if-then” statement was also used to determine whether the specified lease terms would be classified as an operating or capital lease. This FASB 13 analysis will allow departmental managers as well as the Capital Equipment Administrator to confirm operating lease designation early in the acquisition process.

After the lowest cost option is listed on the calculations screen, the user can again select the Decision Input screen to perform sensitivity analysis for salvage value, discount rate, and life of asset. A twenty percent variation from the initial estimate was used to test input variable’s influence on NAL. Although the Capital Equipment Decision Tool created in this project sought to emulate the laborsaving sensitivity analysis the Village Software application exhibited, some user manipulations are still required. The useful life comparison is performed by the computer, and graphed on the Decision Input screen. Again, the steeper the line connecting the three values, the more sensitive the NAL is to value changes. Using the five-year model as the foundation for the sensitivity analysis (the average life of equipment at JHH), the NAL from the initial estimates for the salvage value and discount rate are graphed. The user must manually change the value on the initial input screen (highlighted in blue) to derive an NAL. Once the NAL is calculated, the user will enter that number in the sensitivity analysis column which corresponds to the input variable’s value. This iterative process will generate a graphed line depicting the relationship between input and output variables. Sensitivity analysis will assist decision makers in isolating those factors which greatly influence NAL, and to take greater care in choosing estimate values.

The next stage of development should focus on testing the spreadsheet, using actual departmental equipment requisitions to evaluate lease vs. purchasing financing strategies. Unfortunately the departure of the incumbent Capital Equipment Administrator delayed the testing phase, which will resume when his replacement is named. After the Capital Equipment Administrator reviews the spreadsheet, its functionality should be tested in a single department. Because the Department of Pathology is engaged in many lease arrangements, Pathology would be an ideal location to launch the first version of the decision tool. Pathology would then evaluate the Capital Equipment Decision Tool to see if the program met the needs originally specified. If changes were required, they would be incorporated into the spreadsheet before distributing the program to other departments with large equipment inventories.

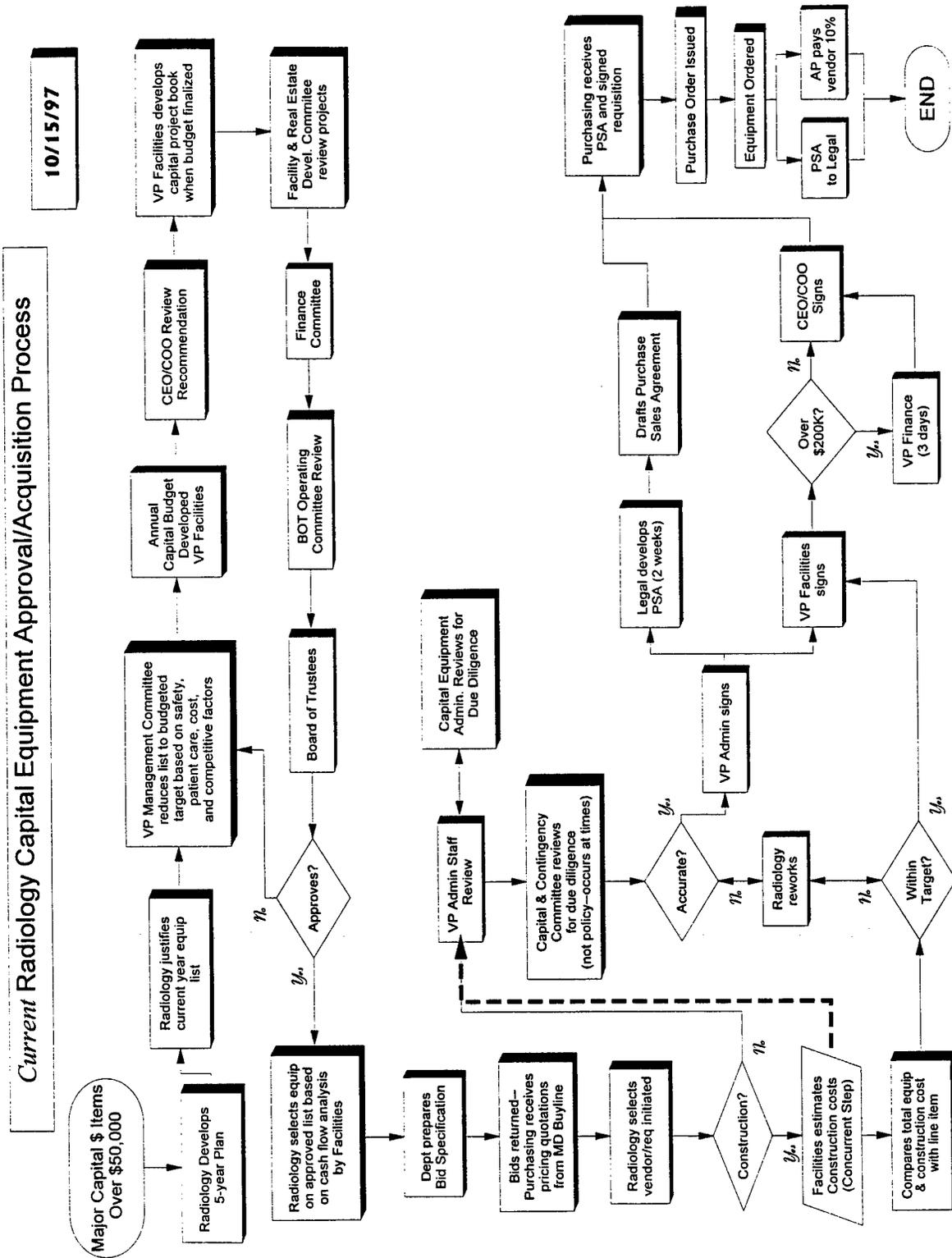
Conclusion and Recommendations

Initially envisioned as a project which aimed to tackle bureaucratic time lapses in the capital equipment requisition process for Radiology, this project also addressed institutional concerns regarding due diligence and leasing and purchasing acquisition strategies. A technology-enamored industry such as health care must have a systematic way of evaluating equipment requests from financial and clinical perspectives. This sample equipment acquisition flowchart could apply to other technology intensive units such as Pathology and Surgery. Using this project as a guide, future studies could evaluate and adopt strategies used in technology assessments for Radiology equipment to formulate institutional procedures.

The repercussions of evaluating different equipment acquisition strategies could change the institutional propensity toward purchasing capital equipment. By providing each hospital department with a copy of the Capital Equipment Decision Tool spreadsheet, financial analysis will be performed at the earliest point in the acquisition process to determine the most financially

beneficial decision choice. Coupled with qualitative criteria such as the impact on patient care and the support of organizational strategies, this financial analysis will strengthen equipment justifications submitted by departments. Such comprehensive and well-documented analyses will in turn satisfy organizational due diligence requirements and expedite the equipment approval and requisition process.

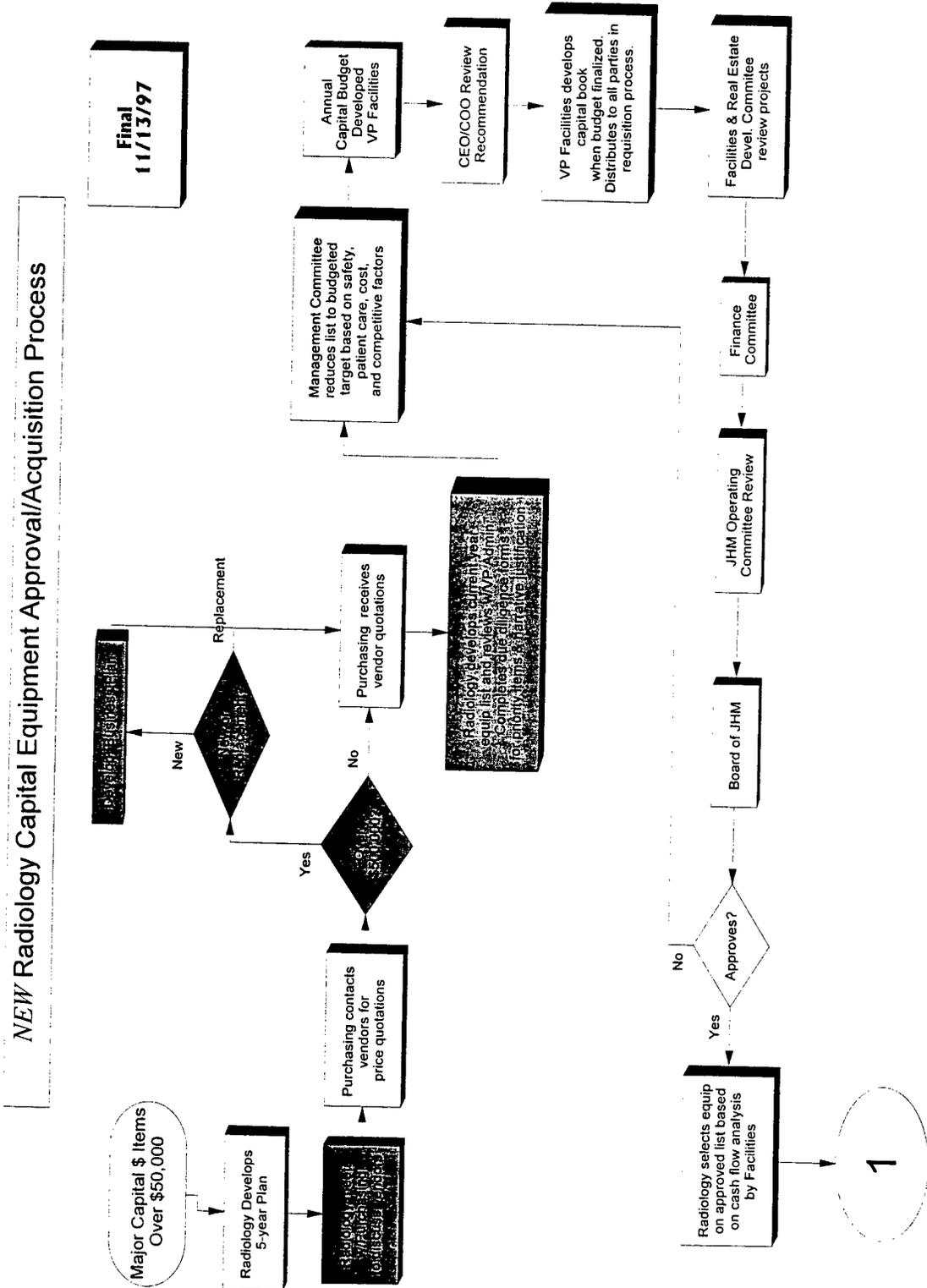
Appendix A



Current Radiology Capital Equipment Approval/Acquisition Process

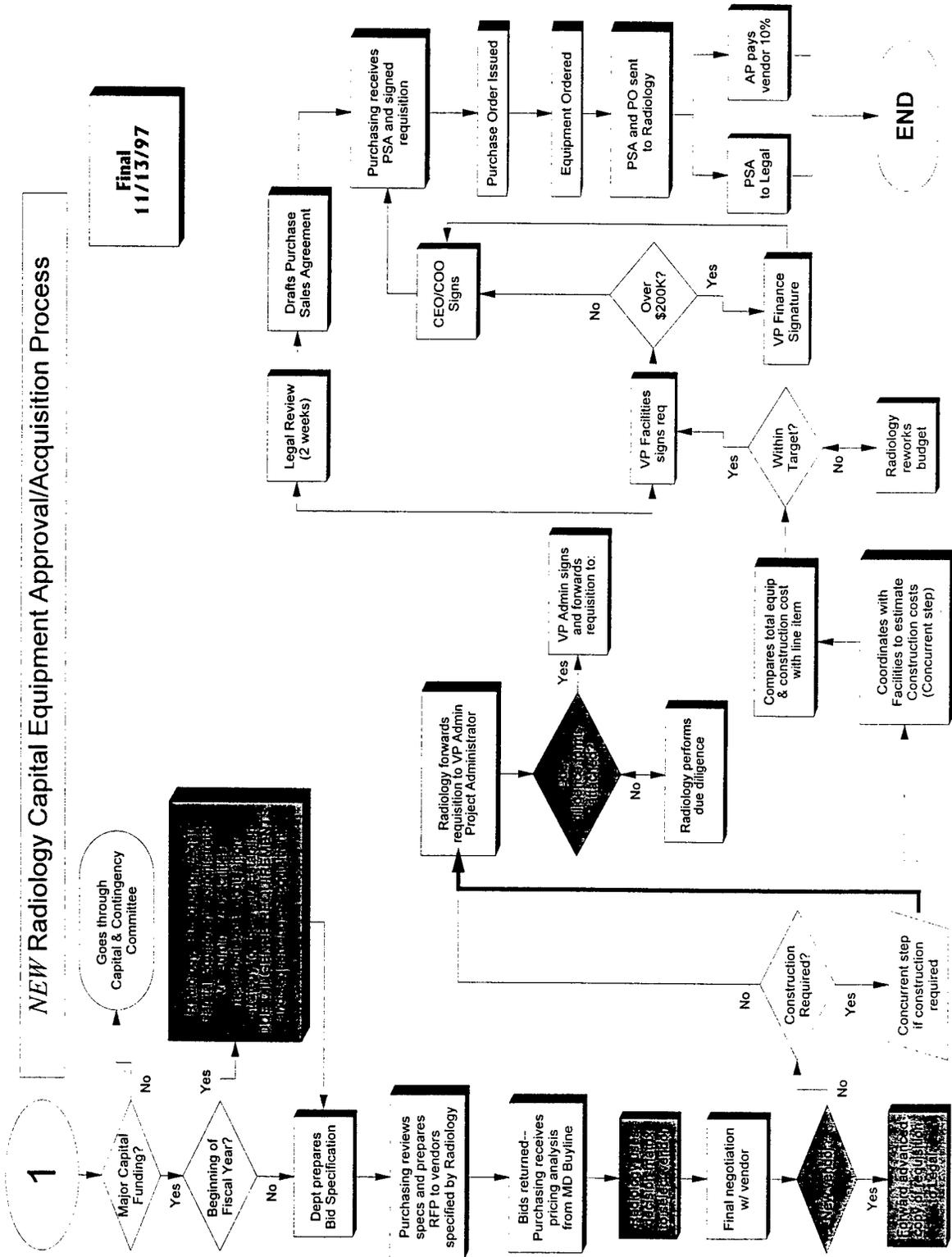
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Appendix B



**Final
11/13/97**

Appendix B



NEW Radiology Capital Equipment Approval/Acquisition Process

Final 11/13/97

Capital Equipment Decision Tool Lease vs. Purchase Financing

Instructions to User

You will only need to enter data on those fields outlined in blue on this sheet. The calculations and decision results for leasing or purchasing will be found on separate sheets which cannot be altered.

Fair Market Value: Corporate Purchasing can provide the MD Buyline price comparison.

Invoice Price: Purchase price of asset.

Lease Payment: Annual lease payment for the contract duration.

Maintenance Costs: Annual costs projections for purchased equipment.

Loan Interest Rate: Assumed to be 8% for Johns Hopkins, adjusted 3% points (up to 12%) if the project is considered to be risky (i.e. uncertain about several variables).

This is perhaps the most important estimate for the decision tool.

Sensitivity analysis

At the bottom of this sheet, you will find a series of graphs which show how variables such as loan interest rate, salvage value and useful life affect the Net Advantage of Leasing. This feature will allow you isolate those variables which have the greatest impact on the decision, and require more accurate estimations. Again the only cells you need to complete are outlined in blue. Based on your initial estimate, you're going to see how estimates above and below that estimate influence the NAL. For example, if you used \$20K as your initial salvage value estimate, scroll to the sensitivity analysis screen and look at the other values listed in black. Substitute each of the two values in the initial input screen (in blue) and select the five-year timeframe. Copy the resulting NAL for each value (in this example \$16K and \$24K) and enter it in the corresponding NAL cell in the sensitivity analysis area of the Decision Inputs screen. A graph will illustrate the relationship of the variable to the NAL. The steeper the line the greater the influence the variable has the ultimate lease vs. purchase decision.

NOTE: Rename the file before you begin to ensure the original copy is not corrupted. Also save original to a disk.

INPUT DATA:

Fair Market Value (MD Buyline)	\$275,000
Invoice price	\$200,000
Lease payment (annual)	\$57,000
Term of lease	To be an operating lease, lease term must be < or = to 80% of the economic life of asset. Cash flows associated with each leasing scenario will reflect the different timeframes.

Maintenance cost (annual)	\$2,500
Loan interest rate	10.0%
Estimated salvage value	\$20,000
After-tax SV discount rate	10.0%
Tax rate	0.0%

Useful life of equipment
(Click on the applicable time frame
and you will be taken to the
calculations sheets.)

Appendix D

Capital Equipment Decision Tool
Lease vs. Purchase Financing

INPUT DATA:

Useful life of equipment **3**

Term of lease **2**

Fair Market Value of Equipment \$275,000

Invoice price \$200,000

Lease payment (annual) \$57,000

Maintenance cost (annual) \$2,500

Loan interest rate 10.0%

Estimated salvage value \$20,000

After-tax RV discount rate 10.0%

Tax rate 0.0%

KEY OUTPUT:

Net Advantage of Leasing **\$79,426**

Internal Rate of Return **-39.7%**

Lower Cost Option:
NAL **LEASE**
IRR **LEASE**

Lease FASB 13 Check
FMV **Operating Lease**
Lease Term **Operating Lease**

MODEL-GENERATED DATA:

MACRS Depreciation Table:

Year	MACRS Rate	Basis	Depreciation Expense	Ending Book Value
1	0.33	\$200,000	\$66,000	\$134,000
2	0.45	\$200,000	90,000	44,000
3	0.15	\$200,000	30,000	14,000
4	0.07	\$200,000	14,000	(0)
			<u>\$200,000</u>	

Appendix D

3 Year Model

Discount Rate:	10.0%		
Cost of Owning:			
	Year 0	Year 1	Year 2
Equipment cost	(\$200,000)		
Maintenance	(2,500)	(2,500)	
Maint tax savings	0	0	
Depreciation shield		0	0
Salvage value			20,000
Salvage value tax			0
Net owning CF	(\$202,500)	(\$2,500)	\$20,000
PV cost owning:	(\$188,244)		
Cost of Leasing:			
Lease payment	(\$57,000)	(\$57,000)	
Payment tax savings	0	0	
Net leasing CF	(\$57,000)	(\$57,000)	\$0
PV cost leasing:	(\$108,818)		
NAL = PV cost of leasing - PV cost of owning =			\$79,426
Net Cost of Leasing versus Owning:			
Lease CF - Own CF	\$145,500	(\$54,500)	(\$20,000)
Lessee's NAL =			\$79,426
Lessee's IRR =			-39.7%

Appendix E

5 Year Model

Capital Equipment Decision Tool
Lease vs. Purchase Financing

INPUT DATA:

Useful life of equipment **5**
 Term of Lease **4**
 Fair Market Value \$275,000
 Invoice price \$200,000
 Lease payment (annual) \$57,000
 Maintenance cost (annual) \$2,500
 Loan interest rate 10.0%
 Estimated salvage value \$20,000
 After-tax SV discount rate 10.0%
 Tax rate 0.0%

KEY OUTPUT:

Net Advantage of Leasing **(\$3,694)**
 Internal Rate of Return **11.3%**
 Lower Cost Option: **PURCHASE**
 PURCHASE
 Lease FASB 13 Check **Operating Lease**
 FMV **Operating Lease**
 Lease Term

MODEL-GENERATED DATA:

MACRS Depreciation Table:

Year	MACRS Rate	Basis	Depreciation Expense	Ending Book Value
1	0.20	\$200,000	\$40,000	\$160,000
2	0.32	\$200,000	64,000	96,000
3	0.19	\$200,000	38,000	58,000
4	0.12	\$200,000	24,000	34,000
5	0.11	\$200,000	22,000	12,000
6	0.06	\$200,000	12,000	0
			<u>\$200,000</u>	

Appendix E

5 Year Model

	Year 0	Year 1	Year 2	Year 3	Year 4
Discount Rate:		10.0%			
Cost of Owning:					
Equipment cost	(\$200,000)				
Maintenance	(2,500)	(2,500)	(2,500)	(2,500)	
Maint tax savings	0	0	0	0	
Depreciation shield	0	0	0	0	\$0
Salvage value					20,000
Salvage value tax					0
Net owning CF	(\$202,500)	(\$2,500)	(\$2,500)	(\$2,500)	\$20,000
PV cost owning:	(\$195,057)				
Cost of Leasing:					
Lease payment	(\$57,000)	(\$57,000)	(\$57,000)	(\$57,000)	
Payment tax savings	0	0	0	0	
Net leasing CF	(\$57,000)	(\$57,000)	(\$57,000)	(\$57,000)	\$0
PV cost leasing:	(\$198,751)				
NAL = PV cost of leasing - PV cost of owning =			(\$3,694)		
Net Cost of Leasing versus Owning:					
Lease CF - Own CF	\$145,500	(\$54,500)	(\$54,500)	(\$54,500)	(\$20,000)
Lessee's NAL =					(\$3,694)
Lessee's IRR =					11.3%

Appendix F

7 Year Model

Capital Equipment Decision Tool
Lease vs. Purchase Financing

INPUT DATA:

Useful life of equipment **7**
 Term of lease **5.6**
 Fair Market Value \$275,000
 Invoice price \$200,000
 Lease payment (Annual) \$57,000
 Maintenance cost (annual) \$2,500
 Loan interest rate 10.0%
 Estimated salvage value \$20,000
 After-tax SV discount rate 10.0%
 Tax rate 0.0%

KEY OUTPUT:

Net Advantage of Leasing **(\$72,387)**
 Internal Rate of Return **27.0%**
 Lower Cost Option:
 NAL **PURCHASE**
 IRR **PURCHASE**
 Lease FASB 13 Check **Financial Lease**
 FMV **Operating Lease**
 Lease Term

MODEL-GENERATED DATA:

MACRS Depreciation Table:

Year	MACRS Rate	Basis	Depreciation Expense	Ending Book Value
1	0.14	\$200,000	\$28,000	\$172,000
2	0.25	\$200,000	50,000	122,000
3	0.18	\$200,000	36,000	86,000
4	0.12	\$200,000	24,000	62,000
5	0.09	\$200,000	18,000	44,000
6	0.09	\$200,000	18,000	26,000
7	0.09	\$200,000	18,000	8,000
8	0.04	\$200,000	8,000	0
			<u>\$200,000</u>	

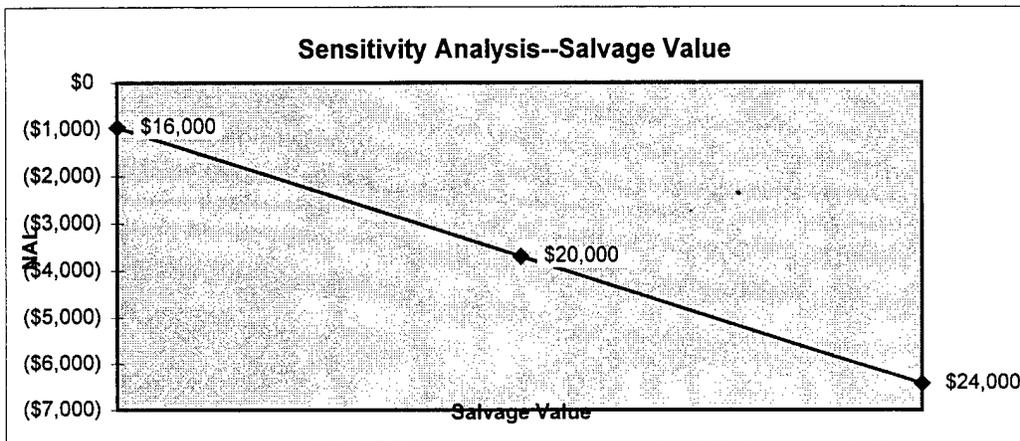
Appendix F

7 Year Model

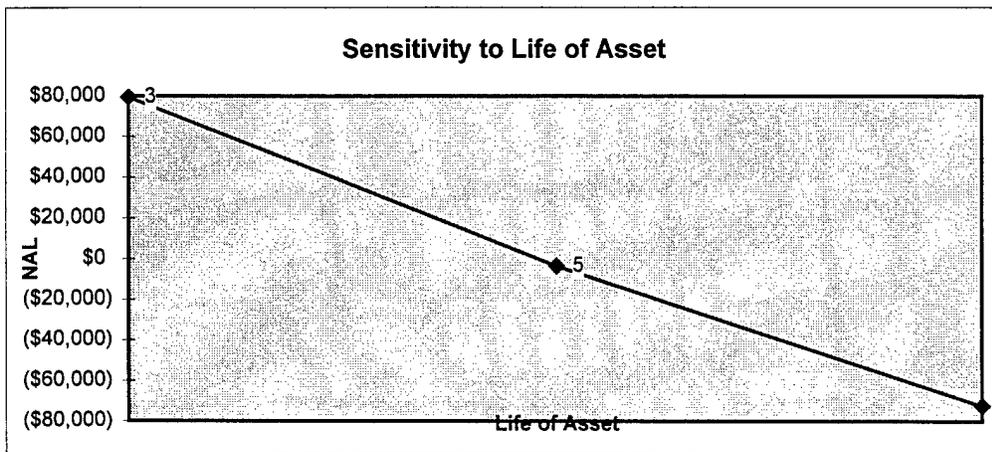
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Discount Rate:	10.0%						
Cost of Owning:							
Equipment cost	(\$200,000)						
Maintenance	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	(2,500)	
Maint tax savings	0	0	0	0	0	0	
Depreciation shield	0	0	0	0	\$0	\$0	-
Salvage value							20,000
Salvage value tax							0
Net owning CF	(\$202,500)	(\$2,500)	(\$2,500)	(\$2,500)	(\$2,500)	(\$2,500)	\$20,000
PV cost owning:	(\$200,687)						
Cost of Leasing:							
Lease payment	(\$57,000)	(\$57,000)	(\$57,000)	(\$57,000)	(\$57,000)	(\$57,000)	
Payment tax savings	0	0	0	0	0	0	
Net leasing CF	(\$57,000)	(\$57,000)	(\$57,000)	(\$57,000)	(\$57,000)	(\$57,000)	0
PV cost leasing:	(\$273,075)						
NAL = PV cost of leasing - PV cost of owning =						(\$72,387)	
Net Cost of Leasing versus Owning:							
Lease CF - Own CF	\$145,500	(\$54,500)	(\$54,500)	(\$54,500)	(\$54,500)	(\$54,500)	(\$20,000)
Lessee's NAL =						(\$72,387)	
Lessee's IRR =						27.0%	

Sensitivity Analysis

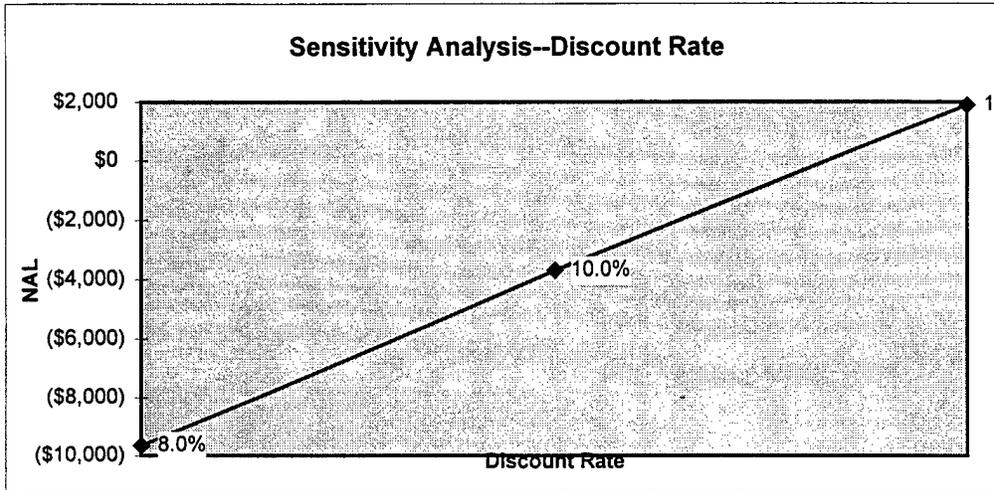
Salvage Value Estimate	Salvage Value	NAL
Default to 5 year model	\$ 16,000	(\$962)
Baseline---	\$ 20,000	(\$3,694)
	\$ 24,000	(\$6,426)



Life of Asset	Life	NAL
NPV	3	\$79,426
Baseline	5	(\$3,694)
	7	(\$72,387)



Discount Rate	Rate	NAL
Default to 5-year model	8.0%	(\$9,652)
Baseline---	10.0%	(\$3,694)
	12.0%	\$1,890



Glossary

Cost of Capital: The rate upon which to evaluate capital investment decisions. Also considered the opportunity cost of investing funds in the present venture compared to an alternative investment of similar risk.

Discount Rate: See cost of capital. The percentage rate used to reduce or “discount” future cash flows to present value terms.

Financial Accounting Standards Board (FASB) Rule 13: Specifies criteria for operating lease classifications.

Internal Rate of Return (IRR): The discount rate which equates all future cash flows to the present value cost of the project.

Net Advantage of Leasing (NAL): A positive NAL reflects the financial advantage of leasing compared to purchasing. This is derived by subtracting the NPV of owning from the NPV of leasing.

Net Present Value (NPV): Process of translating the sum of future cash outflows and inflows to its corresponding dollar amount in the current time period.

Salvage Value: The fair market value of purchased equipment at the end of its useful life.

References

American Political Network. (1997, December 15). Medical equipment: industry hit by Asian market woes. [WWW document: Health Line]. URL <http://web.lexis.nexis.com/univers...>

Anderson, H. J. (1992, September 20). Survey: equipment budgets up; use in outpatient areas growing. Hospitals, 66 (18), 44.

Bayless, M. E. and Diltz, J. D. (1985, October). Leasing strategies reduce the cost of financing healthcare equipment. Healthcare Financial Management, 38-48.

Franklin, J. D. and Altman, D. (1996, July/August). Technology assessment and equipment management: a practical approach to cost reduction. Journal of Healthcare Resource Management, 14 (6), 16-19.

Gapenski, L. C. (1996). Understanding health care financial management. Chicago, IL: AUPHA Press/Health Administration Press.

Gapenski, L. C. and Langland-Orban, B. (1991, Summer). Leasing capital assets and durable goods: opinions and practices in Florida hospitals. Health Care Management Review, 16 (3), 73-81.

Gapenski, L. C. (1993, August). Capital investment analysis: three methods. Healthcare Financial Management, 47 (8), 60-66.

Goodman, C. S. (1997, March-April). Closer inspection: the recent evolution of technology assessment. Health Systems Review, 30 (2), 38-44.

The Health Care Advisory Board. (1995, October). Technical equipment committee Profiles. Washington DC: The Advisory Board Company.

The Health Care Advisory Board. (1995, August 25). Capital equipment processes. Washington DC: The Advisory Board Company.

Held, G. (1991). The equipment acquisition book: what, when, where, and how to buy. New York, NY: Van Nostrand Reinhold.

Kane, N. M. and Manoukian, P. D. (1989, November 16). The effect of the Medicare prospective payment system on the adoption of new technology. New England Journal of Medicine, 321 (20), 1378-1383.

Martin, R. (1997, July 1). Internal rate of return revisited [WWW document]. Available: URL <http://www.texas.net/~rmartin/nr7aa003.html>.

Nauert, R. C. (1995, Summer). Academic medical centers and the fight for survival in the new era of managed care. Journal of Health Care Finance, 21 (4), 47-59.

Nunnally, B. H., Plath, D. A., & Johns, H. W. (1991). Corporate lease analysis: a guide to concepts and evaluation. Westport, CT: Quorum Books.

Pritchard, R. E. & Hindelang, T. J. (1984). Making the lease/buy decision. New York, NY: American Management Associations.

Rosenbaum, S. (1991, August). Financing options loom for capital equipment. Hospital Materiel Management, 16 (8), 9-11.

Sadock, J. M. (1995, August). Planning equipment acquisitions. Journal of healthcare resource management, 13 (8), 16-21.

The Universal Almanac, 1997. (1996). Kansas City, MO: Andrews and McMeel Publishers.

U.S. Bureau of Census. (1997) Statistical Abstract of the U.S. 1997. (117th Ed.). Washington DC: Author.

Weingart, S. N. (1993, Fall). Acquiring advanced technology. Decision-making strategies at twelve medical centers. International Journal of Technology Assessment in Health Care, 9 (4), 530-538.

Weingart, S. N. (1995, Spring). Deciding to buy expensive technology. The case of the biliary lithotripsy. International Journal of Technology Assessment in Health Care, 11(2), 301-315.

Werner, C. (1991, August). Technology assessment taking center stage in capital acquisition process. Hospital Materiel Management, 18 (3), 8-9.

Williams, S. J. & Torrens, P. R. (1993). Introduction to health services. Albany, NY: Delmar Publishers.